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EXAMINER	
NGO, NGUYEN HOANG	
ART UNIT	PAPER NUMBER
2616	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/628,964	CHAUDHURI ET AL.	
	Examiner	Art Unit	
	Nguyen Ngo	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Stochastic Approaches to compute Shared Mesh Restored Lightpaths in Optical Network Architectures by Bouillet, E., Labourdette, J-F, Ellinas, G., Ramamurthy, R., and Chaudhuri, S., hereafter referred to as Bouillet.

Regarding claim 1, Bouillet discloses a method of selecting paths (set-up the path, page 804,left column, paragraph 5) comprising the steps of:

a) computing a plurality of first shortest paths from a source point to a destination point each including of a serial chain of at least one communications link (compute k-shortest paths, page 804, left column, paragraph 5);

b) selecting K first shortest paths from the plurality (compute k-shortest paths);

c) ordering the selected K first shortest paths from shortest to longest (Sort the paths by length and denominate them w1 to wk, page 804, left column, paragraph 5);

d) for each first shortest path of K (for each shortest path wi, page 804, left column, paragraph 5),

i) computing the cost of the first shortest path as substantially equal to the combined cost of the links included in the first shortest path (compute the shortest path si using the metric defined in parts, (page 804, left column, paragraph 5);

ii) selecting a lowest estimated cost second shortest path from the remainder of the elements of K, where the estimated cost of the second shortest path is computed as substantially equal to the combined estimated cost of the links included in the second shortest path and the cost of a link corresponds to the cost of using the link scaled by a probability that the link can be shared by the second shortest path and a path already provisioned using a channel of the link (to each edge that shares a SRG with wi assign infinite weight and for each edge with reserved channel, set weight to cost of edges time the probability that no reserved channel is shareable, page 804, left column, paragraph 5);

e) selecting the lowest estimated combined cost first and second shortest path pair (select the minimum cost path pair, page 804, left column, paragraph 5).

It should further be noted that Applicant specifically states "Our method is described by Bouillet ... in a paper entitled "Stochastic Approaches to Route Shared Mesh Restored Lightpaths in Optical Mesh Networks, " in the Proceedings of the Conference on

Computer Communications, in June 2002, on page 801 through 807", in the specification in paragraph [020].

Regarding claim 2 Bouillet discloses the method according to claim 1, wherein for a second shortest path, the cost of a link is estimated by;

a) assigning an infinite cost to a link included in an associated first shortest path;

b) assigning an infinite cost to a link that traverses at least one shared-risk-group (SRG) traversed by an associated first shortest path ((i) to each edge that shares a SRG with wi or has neither available channel nor reserved channel, assign infinite weight, page 804, left column, paragraph 5);

c) assigning to a link not having an available shared protection channel a cost substantially equal to the cost of allocating an additional shared protection channel to the link ((ii) for each edge without a reserved channel, set weight to cost of edge, page 804, left column, paragraph 5);

d) estimating for a link having at least one available shared protection channel a cost corresponding to the cost of using the link scaled by a probability that the link can be shared by the second path under consideration and no backup paths already provisioned using the link ((iii) for each edge with reserved channel, set weight to cost of edge times the probability that no reserved channel is shareable, page 804, left column, paragraph 5).

Regarding claim 3, Bouillet discloses the method of claim 2 wherein the probability that the link can be shared by the second path under consideration and no backup path already provisioned using the link is determined according to a method comprising;

a) creating a variable M, and assigning as its value the number of available shared protection channels in the link (M bins are the reserved channels, page 803, right column, paragraph 2);

b) for each j from 1 to N;

i) creating an array of N elements, SRGj, consisting of the N SRGs traversed by a proposed primary path (N SRGs traversed by the primary path for which a reserved channel is sought, page 803, right column, paragraph 2);

ii) creating an array of N elements, nj, consisting of the number of times SRGj is traversed by a primary path protected by a backup path already provisioned using channels of the link (page 803, right column, paragraph 2);

c) computing a probability, p, that one available shared protection channel of a link can be shared by a second shortest path and one backup path already provisioned sing the channel as p=]lj(1-nj/M), for j from 1 to N (page 803, right column, paragraph 1);

d) computing a probability, P, that no available shared protection channel of a link can be shared by a second shortest path with a backup path already provisioned using a channel of the link as P=(1-p)M, page 803, right column, paragraph 2).

Regarding claim 4, Bouillet discloses the method according to claim 1, wherein the lowest cost path pair is selected according to a method comprising;

a) defining an array of K elements, wi, where i ranges from 1 to K, including the ordered K first selected paths;

b) defining an array of K elements, si, where i ranges from 1 to K, including the K second shortest paths associated with the ordered K first selected paths;

c) defining a set, K, comprised of elements {wi,si}, where i ranges from 1 to K;

d) computing the combined estimated cost of the elements of set K, and ordering the elements from lowest combined estimated cost to highest combined estimated cost;

e) selecting the lowest combined estimated cost path pair in set K (page 804 left column).

Regarding claim 13, Bouillet discloses a shared mesh protection network wherein paths are provisioned according to a method comprising;

a) generating a list of at least one candidate pair of paths including one primary path and one associated backup path between a source network element and a destination network element (compute k-shortest paths, page 804, left column, paragraph 5);

b) selecting a lowest estimated path pair from the list where the cost of the primary path is substantially equal to the cost of the network resources included in the primary path and the estimated cost of a backup path corresponds to the cost of the network resources included in the backup path scaled by the probability that existing network resources can be shared by the backup path (select minimum cost path pair, page 804, left column, paragraph 5);

c) using signaling to attempt to establish the selected path pair, use signaling to set-up the path, page 804, left column, paragraph 5);

d) eliminating the selected path pair from the list if it can not be established and attempting to establish a new lowest estimated cost path pair (page 804, left column, paragraph 5);

e) returning an error signal to a network operator if no candidate path pair from the list can be allocated (if no path can be found return NO-PATH, page 804, left column, paragraph 5).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stochastic Approaches to compute Shared Mesh Restored Lightpaths in Optical Network Architectures by Bouillet, E., Labourdette, J-F, Ellinas, G., Ramamurthy, R., and Chaudhuri, S., in view of Wu et al. (US 2004/0042406), hereafter referred to as Bouillet and Wu.

Regarding claim 5, Bouillet discloses a method of selecting paths comprising the steps of:

a) creating a first graph representing a network having a topology containing network elements interconnected by communications links wherein each network represented by a vertex and each communication link interconnecting adjacent network elements is represented by an edge, the first graph containing a source vertex corresponding to an ingress network element and a destination vertex corresponding to an egress network element (topology represented as a graph G(V,E), page 804, left column, paragraph 3);

b) using the first graph to calculate a plurality of paths between the source and destination vertices (bi-directional lightpaths from A to Z, page 804, left column, paragraph 4);

c) selecting K first shortest paths between source vertex and destination vertex (compute k-shortest paths, page 804, left column, paragraph 5);

d) for each first shortest path;

i) computing the cost of the first shortest path (assign weight, page 804, left column, paragraph 5);

iii) Selecting a lowest estimated cost second shortest path from source vertex to destination vertex wherein the estimated cost of the second shortest path is substantially equal to the combined estimated costs of the

edges comprising the second shortest path and the estimated cost of an edge corresponds to the cost of using the edge scaled a probability that the edge can be shared by the second shortest path and a path already provisioned using a channel of the edge (page 804, left column, paragraph 5);;

e) selecting the lowest estimated combined cost first and second shortest path pair (select minimum cost path pair, page 804, left column, paragraph 5).

Bouillet however fails to specifically disclose creating a second graph substantially based on the first graph wherein the second graph includes edges and estimated edge costs and an edge associated with the first shortest path is modified from the first graph. Wu however discloses a method of generating a network graph from network information and calculating a primary explicit route through the network from the generated network graph (page 1 [0012]). It would thus be obvious to a person skilled in the art at the time the invention was made to incorporate the concept of generating a second graph based on network information (first graph information) which includes edge costs as disclosed by Wu into the Stochastic Approaches to Route Shared Mesh Restored Lightpaths in Optical Mesh Networks as disclosed by Bouillet in order to efficiently calculate paths through the network from source to destination.

Regarding claim 6, the combination of Bouillet and Wu, more specifically Wu discloses the method according to claim 5 wherein an edge associated with the first shortest path is modified by removing it from the second graph (the links not meeting the specified constraints got the path are eliminated from the graph, page 1[0012]).

Regarding claim 7, the combination of Bouillet and Wu, more specifically Bouillet discloses a method according to claim 5 wherein an edge associated with the first shortest path is modified by setting its estimated edge cost to a very high value (weight, page 804, left column, paragraph 5).

Regarding claim 8, the combination of Bouillet and Wu, more specifically Bouillet discloses a method according to claim 5 wherein an edge associated with the first shortest path is modified by setting its estimated edge cost to an infinite value (infinite weight, page 804, left column, paragraph 5).

Regarding claim 9, the combination of Bouillet and Wu, more specifically Bouillet discloses the method according to claim 5 wherein the K first shortest paths are ordered from lowest cost to highest cost and assigned to elements w, of set K, where i ranges from 1 to K (page 804, left column, paragraph 5).

Regarding claim 10, the combination of Bouillet and Wu, more specifically Bouillet the method according to claim 5, wherein for each first shortest path a least estimated cost

second shortest path is chosen from the second graph and for each second shortest path in a second graph, the cost of a link is estimated according to a method comprising;

i) assigning an infinite cost to an edge that traverses at least one SRG traversed by the first shortest path ((i) to each edge that shares a SRG with wi or has neither available channel nor reserved channel, assign infinite weight, page 804, left column, paragraph 5);

ii) assigning to an edge without an available shared protection channel a cost substantially equal to the cost of adding an additional shared protection channel to the edge ((ii) for each edge without a reserved channel, set weight to cost of edge, page 804, left column, paragraph 5);

iii) estimating for an edge having at least one available shared protection channel a cost corresponding to the cost of using the edge scaled by probability that the edge can be shared by the second path under consideration and no backup paths already provisioned using the edge ((iii) for each edge with reserved channel, set weight to cost of edge times the probability that no reserved channel is shareable, page 804, left column, paragraph 5).

Regarding claim 11, the combination of Bouillet and Wu, more specifically Bouillet discloses the method of claim 10 wherein the probability that an edge can be shared by

the second path under consideration and no backup path already provisioned using channels of an edge is estimated by;

a) creating a variable M, and assigning as its value to the number of available shared protection channels in the edge (M bins are the reserved channels, page 803, right column, paragraph 2);

b) for each j from 1 to N;

i) creating an array of N elements, SRGj, consisting of the N SRGs traversed by a proposed primary path (N SRGs traversed by the primary path for which a reserved channel is sought, page 803, right column, paragraph 2);

ii) creating an array of N elements, nj, consisting of the number of times SRGj is traversed by a primary path protected by a backup path already provisioned using channels of the link (page 803, right column, paragraph 2);

c) computing a probability, p, that one available shared protection channel of a link can be shared by a second shortest path and one backup path already provisioned sing the channel as p=]lj(1-nj/M), for j from 1 to N (page 803, right column, paragraph 1);

d) computing a probability, P, that no available shared protection channel of a link can be shared by a second shortest path with a backup path already provisioned using a channel of the link as P=(1-p)M, page 803, right column, paragraph 2).

Regarding claim 12, the combination of Bouillet and Wu, more specifically Bouillet discloses the method of claim 5, wherein a lowest estimated combined cost first and second shortest path pair is selected according to a method comprising;

a) creating a set, S, with K elements {wi,si}, where i ranges from 1 to K, including the K first shortest paths, wi, and K associated selected second shortest paths, si (Set S, page 804, left column, paragraph 5);.

b) for each first shortest path, wi, where i ranges from 1 to K;

ii) computing a cost substantially equal to the combined cost of the links included in the first shortest path;

ii) computing an estimated cost for the associated selected second shortest path substantially equal to the combined estimated cost of the links comprising the selected second shortest path page 804, left column, paragraph 5);

d) selecting the lowest combined estimated cost path pair (select minimum cost pair, page 804, left column, paragraph 5).

Bouillet however fails to specifically disclose ordering the elements of set S from lowest combined estimated cost to highest combined estimated cost. However this procedure would have been obvious to a person skilled in the art at the time the invention was made in order to efficiently determine the lowest combined estimated cost path pair in a reliable manner.

6. Claims 14- 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stochastic Approaches to compute Shared Mesh Restored Lightpaths in Optical Network Architectures by Bouillet, E., Labourdette, J-F, Ellinas, G., Ramamurthy, R., and Chaudhuri, S., in view of Ishibashi et al. (US 2003/0147352), hereafter referred to as Bouillet and Ishibashi.

Regarding claim 14, Bouillet fails to specifically disclose the network of Claim 13 wherein path provisioning is controlled by the source network element and signaling is used between the source network element and each network element in a proposed pair of primary and backup paths to establish links between adjacent network elements. However this is a well-known technique known in the art. Ishibashi further discloses that when a path setup request is generated from the source, the network calculates a pair of SRLF- disjoint working and protection paths and that a signaling message is then

transmitted through the network and that bandwidth reservation is performed for both working and protection paths (page 1 [0008]). It would thus be obvious at the time the invention was made to incorporate the well known concept of establishing primary and backup paths between adjacent network nodes through signaling as disclosed by Ishibashi into the Stochastic Approaches to Route Shared Mesh Restored Lightpaths in Optical Mesh Networks as disclosed by Bouillet in order to efficiently establish primary and backup paths through a network.

Regarding claim 15, the combination of Bouillet and Ishibashi further discloses the network of claim 14, wherein said signaling is comprised of the steps of;

a) for each network element in the primary path, sending from the source network element to the network element a request for the network element to establish a link with adjacent network elements (signaling message transmitted through the network and bandwidth reservation is performed for the working path, page 1 [0008]);

b) for each network element in the backup path, sending from a source network element to the network element a request for the network element to establish a link with adjacent network elements (signaling message transmitted through the network and bandwidth reservation is performed for the protection path, page 1 [0008]);

c) for each network element in the primary path that can not establish a link to an adjacent network element, sending from the network element to the source network element an error signal (rejected request, page 6 [0081]);

d) for each network element in the primary path that can establish a link to an adjacent network element, sending from the network element to the source network element a valid link signal (page 7 [0097]);

It should be noted that the steps of establishing links in a network via error signals and valid link signals is a well known concept known in the art.

Regarding claim 16, the combination of Bouillet and Ishibashi discloses the network of Claim 13 wherein the network has a single network controller and signaling between the controller and network elements is used to provision primary and backup paths (network controller of figure 1 and page 6 [0082]).

Regarding claim 17, the combination of Bouillet and Ishibashi fail to disclose the specific limitation of reallocation of existing network resources is initiated at any time. However this would have been obvious to a person skilled in the art at the time the invention was made as this is simply a network parameter informing when reallocation should be determined.

Regarding claim 18, the combination of Bouillet and Ishibashi fail to disclose the specific limitation reallocation of existing network resources is initiated at each request of new communications service. However this would have been obvious to a person skilled in the art at the time the invention was made, as this is simply a network parameter informing when reallocation should be determined.

Regarding claim 19, the combination of Bouillet and Ishibashi fail to disclose the specific limitation reallocation of existing network resources is initiated at regularly scheduled intervals. However this would have been obvious to a person skilled in the art at the time the invention was made, as this is simply a network parameter informing when reallocation should be determined.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a) Pieda et al. (US 2002/0191545), Methods And Apparatus For Selecting Multiple Paths Taking Into Account Shared Risk.

b) Yagyu (US 20030174644), Routing Control Method And Routing Control Apparatus For The Same.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nguyen Ngo whose telephone number is (571) 272-8398. The examiner can normally be reached on Monday-Friday 7am - 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chan can be reached on (571) 272-7493. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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